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FOR THE DESIGN, CONSTRUCTION AND ENJOYMENT OF UNUSUAL SOUND SOURCES

EXPERIMENTAL MUSICAL INSTRUMENTS

REEDS, UKES, SORT-OF-FIDDLES, AND MORE COLOR ORGANS

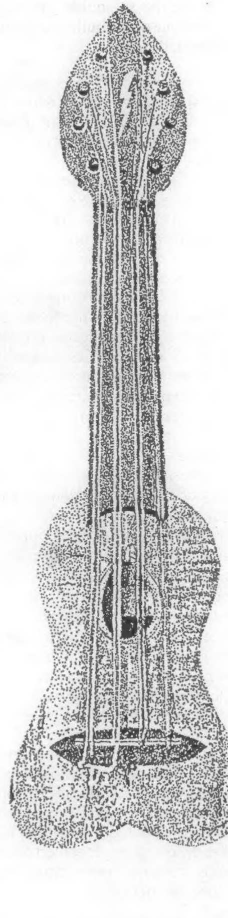
The idea behind single and double reeds, such as those used in clarinets and oboes, is to create a mechanism for converting a steady stream of air into a series of rapid pulses as it enters an elongated tube. The pulsing helps to set up a vibration at the tube's resonant frequency, giving rise to the musical tone. A trumpeter's buzzing lips do likewise. In thinking about these things, a question naturally arises: are there other means by which one could achieve the same sort of pulsing gateway effect? In other words, are there workable wind instrument reed types that haven't yet come into common usage?

In this issue of **Experimental Musical Instruments** we look at one such relatively unknown and unexplored reed type, the membrane reed. It produces a very attractive tone; it is surprisingly easy and inexpensive to make, and, yes, it has a few flaws and needs further refinement. The article starts on page 5.

Also in this issue we have part one of a chronicle of the strange, the quizzical, the organologically anomalous devil's fiddle family of instruments, researched and written by Hal Rammel. We have the second half of Kenneth Peacock's two-part article on color organs, taking us through a body of 20th century synaesthetic exploration. We have a report on avant-ukuleles from Brian Stapleton (the drawing on this page depicts one of them). And we have the usual assortment of reviews, letters, and such.

All good stuff, if you are interested in sound. Open up, and let's get to it.

IN THIS ISSUE



Above: Camallita, made by Brian Stapleton. See the article starting on page 10..
Drawing by Robin Goodfellow.

NOTES FROM HERE AND THERE

In EMI's June 1991 issue we had an article on computer-controlled acoustic musical instruments. It featured, among others things, descriptions of solenoid-activated pianos from a couple of different designers. In a letter appearing in the following issue, Colin Hinz raised the question of unwanted mechanical noise in automatic instruments, wondering whether it is a serious problem with the solenoids. Here, in response, are some thoughts on the subject from one of the builders whose work was featured in the original article, Alistair Riddell.

First, I wholeheartedly approve of the editorial decision [in recording such instruments] not to remove or attempt to remove the mechanical noise which is a part of the sound of mechanical instruments to a greater or lesser degree. I regard such noise (obviously at a sufficiently low level as to not constantly distract the listener's attention) as critical to the context of the music, and as such it is metamusical in its contribution. Noise is important in defining subtle characteristics of contextual space and geometry, as well as that of the instrument itself, for all musical instruments. For instance, having seen and heard Nancarrow's instruments in situ, I now have a fuller appreciation of the particular recording quality present on both the 1750 Arch and newer Wergo recordings. To have studio processed the recordings, e.g. adding more reverberation or room simulation, would have amounted to destroying the sense of Nancarrow's studio, where he composed and produced the pieces. Within these recordings, that, I think, is for the most part given credible representation.

Second, in reply to Colin Hinz's observation about solenoid noise, my experience has not included this operational problem. In cases of both solenoid positions, vertical and horizontal, actual noise caused by the sliding cores (that is, the moving iron component) has not been heard. My recollection is that the movement is so rapid that any noise from this is absorbed in the general sound of the attack. In fact, while the solenoid is under power the core should float free in the magnetic field and only on return might it be in contact with the sleeve. My experience does not encompass slow moving solenoids so I can't comment on behavior in this area.

What, however, is a potential problem is the noise of the solenoid arriving at its quiescent position after the power has been turned off. If the core rapidly returns then some impact noise is likely to be audible unless heavily cushioned. This might occur either when the solenoid cores are under mechanical or gravitational return. In an earlier instrument I didn't find this such a problem but in my recent mechanism I have a feeling that it could be quite disturbing. Coupled with the noise of the return impact is the potential for bounce, but that is more obscure and remains to be seen.

Another problem, particularly with the Pianocorder system [an earlier solenoid-based computer-controlled piano player system], was that the solenoids hummed when left on for periods of time of 10 seconds or more. This is due to the way they are powered when using the original Pianocorder power supply and control circuitry. The simple explanation is that power is supplied for only part of the time (it's turned off and on every 5 ms or so to cut down on power consumption and the problem of the solenoids burning out too quickly) and hence the cores actually oscillated (at about 200 Hz if I remember correctly). When the dynamics were set high on the original system the hum was distracting.

There is, certainly, more scope for discussion about noise here but I'll leave that for another occasion.

Just a brief follow up on my recent work. I spent some time discussing future directions with a mechanical engineer and also did some homework of my own. It comes down to the issue of whether I want to get the piano player system working as I had envisioned it or get a lesser mechanism functioning with probably limited scope for experimentation. At the moment the problem lies in controlling the action and not primarily in the mechanical components themselves. Theoretically, it should be possible to activate any combination of the approximately 160 solenoids in a very short time span between the initial request and the sound. This is probably not possible with resources at my disposal but at least an interesting subset should be available. There are other minor problems like power supplies, working space, pianos, composition and aesthetics that make this project somewhat frustrating. Well, given the difficulties inherent in the logistics of this research (space is at a premium and good pianos are in demand, yes even around here) I'll probably opt for the quick and dirty solution for the short term, just to initiate some investigation. At the moment I'd be pleased to see the action function outside the piano, in order to measure its performance and behavior. From the workbench, if all is satisfactory, it could be moved into a piano for final testing and compositional investigation. But this seems to me quite a way down the track.

Alistair Riddell

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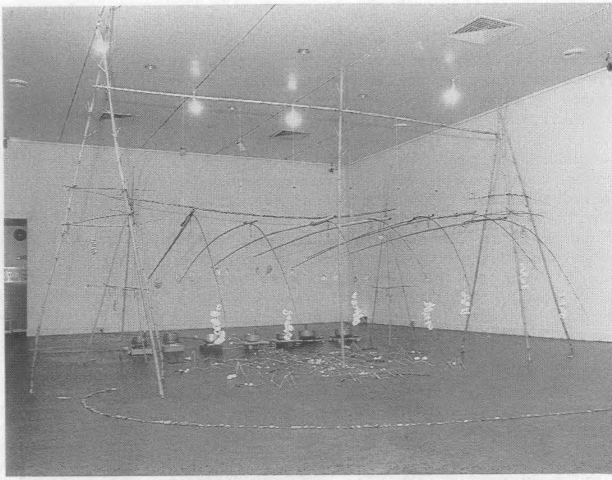
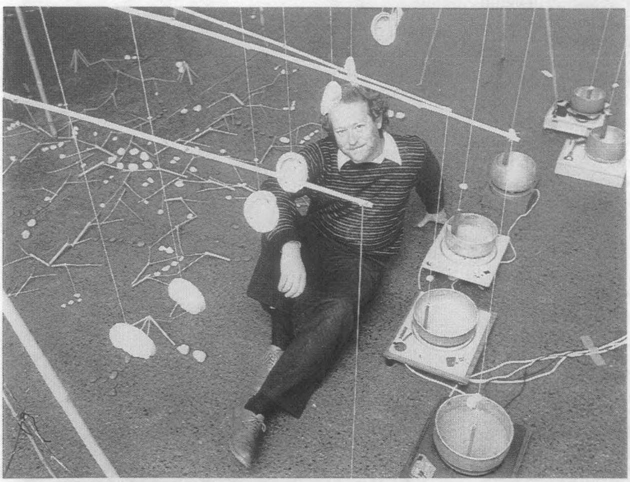
SUBMISSIONS: Experimental Musical Instruments welcomes submissions of articles relating to new or unusual musical instruments. A query letter or phone call is suggested before sending articles. Include a return envelope with submissions.

'BALANCED BEAMS' was the title of the sound sculpture seen in the photographs here. It was built in June 1991 at Monash University Gallery, Melbourne, Australia by composer Ernie Althoff and exhibited for three weeks. The first picture shows the 20-foot wide bamboo support structure, and the seven balanced horizontal poles hung from twisted strings. The second picture shows Althoff seated at the row of seven rotating aluminium bowls into which the wooden beaters are suspended from the poles. Bell-like tones sounded when the beaters drifted toward the inside faces and were knocked by strips of cardboard inside the bowls. The large suspended shells in the foreground served as restrainers for the lateral swing of the poles. Three small audience-operated homemade drum machines around the walls completed the installation.





THE PIANO REINCARNATION PROJECT

EMI'S frequent correspondent Ivor Darreg recently sent along these thoughts on one of his favored topics, piano obsolescence:

Back in the 1920's when I was a little boy, the average home or even apartment had a piano, and many children were made to take piano lessons. There was a sharp dichotomy between Classical and Popular and never the twain should meet! But at least one thing was common to the two kinds of piano players — they went to the stores and bought sheet music.

Then, people could afford pianos. Now, in the Eighties, people can't afford them; many apartment houses forbid tenants to have a piano; and even such an affair as major repairs or restringing is absolutely unheard of these days. Hence the pianos of America have a sizable and ever-growing Silent Majority. Some people simply can't afford to keep their pianos as a piece of furniture, a Status Symbol — especially grand pianos — and maybe they will spend some money on refinishing it, but hardly on keeping it tuned or in the kind of good shape necessary to perform the vast piano literature properly.

This should be no real surprise: things do change in 60 years. There are new instruments, and new kinds of music. New lifestyles and new housing patterns. New social conditions.

So, What should be Done About It? Why not a Piano Reincarnation Project? Let's take the old clunkers, the worn-out wrecks, the hopelessly neglected pianos, and convert them into something else: bookcases, tables, furniture of fine seasoned wood. The keyboards can be adapted to electronic organs and synthesizers and even harpsichords and clavichords. The tuning pins and sounding boards and some of the other woodwork can be used to make psalteries and harp-like instruments and new kinds of things both musical and non-musical, limited only by the imagination and creativity of today's do-it-yourselfers and craftspeople. Some of the parts and pieces will have to be discarded or sold to a junkman, but it is surprising what a new lease on life most of this material could be given. In particular, some of the hardwoods are well

seasoned, and now rare and expensive, so well worth the effort of recycling.

Piano actions are made of strange-looking wooden parts and felt and little screws and springs and other goodies, which can be used for many purposes by ingenious persons. So, instead of leaving this vast silent majority of defunct or moribund pianos — ex-pianos, really! — to deteriorate any further, we can enjoy them in their reincarnated versions. If we don't recycle these worn-out instruments, the image and prestige of the Piano along with the memory of its glorious past will further deteriorate and finally be beyond any repair. Something of this kind has already happened to the idea of the Organ as the King of Instruments — it's really a shame that things can go to rack and ruin this way because nobody cares.

If you know any enthusiastic woodworkers and handicrafters, alert them to this gold mine of Treasure Trove. It might even get them musically inclined. The musical world needs this new blood from outside. And the home workshop people need to have their constructive imaginations encouraged and stimulated. Why, it could even be profitable for some.

CALL FOR INFORMATION AND IDEAS

Experimental Musical Instruments is planning to pull together some descriptions of make-as-you-go instruments – instruments to be made quickly and easily, on the spur of the moment, without special tools, from common natural or found materials. Things, in other words, that one could pick up, prepare and play while walking in the country, or perhaps walking home from school or work. This would include things like various sorts of leaf oboes, candy wrapper or grass-blade ribbon reeds, hollow vegetable stalk whistles, barb wire fence percussion or picket fence percussion, and so forth and so on. Kids the world over are particularly good at coming up with and passing on sound ideas like this; perhaps you knew of a few in earlier years. Or perhaps you've come up with some more recently. If so, please send a description to EMI at Box 784, Nicasio, CA 94946.

PLANS FOR EMI'S FUTURE. FEEDBACK, PLEASE.

Experimental Musical Instruments has been publishing for just under 7 years now. During that time we have built a good reputation for on-time publication (never a late issue); we have substantially enlarged and improved the newsletter; and we've never had a rise in price. At $20 a year the subscription price was high in the beginning, when the newsletter itself was a short but sincere 16 pages. The decision to initially set the price high was a deliberate one, and in retrospect a good one, since it has allowed us to carry on this long without an increase. Now, seven inflationary years later, with a newsletter half again as long, it is finally time to up the price to reflect the very substantial increases in operating costs – or, more to the point, to reflect the fact that EMI can't continue at the present price, unless perchance a fairy godmother appears.

(Yes, popular newsstand magazines give you many more pages and color printing at much lower prices. They achieve this partly by virtue of economies of scale that kick in when subscriber lists reach into the tens and hundreds of thousands, and more importantly by virtue of their being in a position to attract a great deal of expensive advertising, which allows them to sell subscriptions well below their production cost. EMI will never have anything approaching the numbers to play by those rules; we simply have to set subscription price to reflect small-scale production costs.)

We are considering two possible approaches to the price rise, and this is where we could use some opinions from readers.

1) Bump the yearly subscription price up to $30, with corresponding rises for back issues and cassettes. Keep the product – publication schedule, magazine length and so forth – basically unchanged.

2) Change the publication schedule from bi-monthly to quarterly. Increase the number of pages per issue, so that subscribers receive at the minimum the same total number of pages in the course of the year as always. Savings in postage and printing, even with the increased issue size, would allow a smaller bump in subscription price, perhaps to $25. Back issue and cassette price rises would be about the same as with the first option.

The advantage of proposal #1 is that our traditional bi-monthly publication schedule has helped make EMI one of the most happening things going – every time you turn around, there's the blankety-blank thing in the mail box again. But the considerably higher price just might tip the affordability scale for more than a few subscribers. The advantage of #2 is that subscribers get as much substance – perhaps more – with less of a price bump. A number of smaller changes, most but not all of them positive, would also take place in connection with the longer format.

At this time, as you may have guessed, the management brain trust is favoring proposal #2. But the decision is not yet made. The new arrangements, whatever they turn out to be, will go into effect with the start of EMI's volume VIII, next summer. Renewals received before then, including early renewals for subscriptions due to expire later, will be accepted at the old rate.

If you've got an opinion on these proposals, let us know: EMI, Box 784, Nicasio, CA 94946.

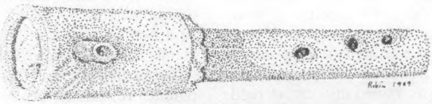
MEMBRANE REEDS

Indonesia and Nicasio

by Bart Hopkin

This article describes an unusual sort of reed for use in wind instruments. When I began experimenting with this reed type, I thought I was doing original work. I later discovered that there is nothing new under the sun, and that instruments using the same principle already existed, albeit in very different form, on the other side of the globe in Indonesia. And – who knows? – perhaps they can be found elsewhere as well. In this article we'll look at both the Indonesian forms and my own work.

I have been calling the reed type a *membrane reed*, because the most important element is a small, stretched membrane of some kind covering the mouthpiece end of a wind instrument tube. When air is forced under this membrane and into the tube, it starts a standing wave in the tube at the tube's resonant frequency. If the tube happens to be equipped with properly spaced toneholes, the thing will play like any other wind instrument. I'll describe all this in detail soon. But first, since the word "reed" may be confusing in connection with something so un-reedlike as a stretched membrane, let me clarify the sense of my usage.



Membrane reed instrument from Sumatra
(Drawing by Robin Goodfellow)

The term *reed instrument*, as it is commonly used, covers a subset of the larger category of wind instruments. Reed instruments usually make use of a tuned air column in the form of a tube of some sort. The tube is equipped with something that serves as an open-and-closable gateway at the mouth, so that an air flow into the tube can be alternately restricted and allowed to pass more freely. Whatever serves as the gate is flexible enough to be responsive to pressure variations occurring within the tube, so that a standing wave set up in the tube will cause the gate to open at a moment of maximum internal pressure, and close at minimum pressure. Thus, when air is forced through the gate and into the tube, it tends to enter not in a steady stream, but in a series of pulses. The frequency of the pulses is determined by the open-and-shut frequency of the gateway, which (if all goes well) is controlled primarily by the standing wave frequency in the tube. By these means are the reed instrument's vibrations instigated and perpetuated, and its sounding pitch determined.

Whatever serves as the gate in this gating arrangement is the reed. Many reed instruments actually use pieces of natural reed (usually carved from the cane reed species known as arundo donax). But the term is applied inclusively to all instruments using such gating systems, and many of them use non-reed reeds. We are familiar with several sorts of reeds, including the cane reeds used in the air-gating arrangements of clarinets and oboes; the free reeds, usually of metal, used in harmonicas, accordions and most organ reed pipes; and the "lip reeds" used in trumpets and other brass (while this last usage is unconventional, several writers on musical instrument acoustics have found the phrase useful).

It was thinking about these several common types that led me to the simple question, *what other ways might there be to create pressure-responsive gating of an air stream as it enters a tube?* In other words, could one come up with other musically useful reed types?

NICASIO

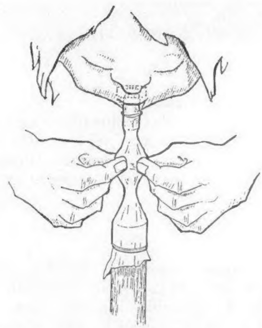
I had the seemingly promising idea that it should be possible to create a sort of double reed in reverse. Rather than closing under pressure from the outside air source, then reopening in response to a combination of its own internal stresses and pressure from within the tube (which is what an oboe reed does), it would open under pressure from the outside source, and then reclose under its own internal mechanical forces and pressure from within the tube. This is what the trumpeter's lip reed does, but my thought was to create a separate mechanism to do it. And I had an already familiar and functioning model, for this is also what the mouth of a balloon does when you inflate the balloon, then pinch and pull tight the opening to release the air with a protracted squeal. In an attempt to lend some dignity to the situation, I will refer to this type of air-flow gating system as a *labial reed*.

My idea was to introduce the output of a labial reed into a tube and hope that its opening and closing frequency would conform to the resonant frequency of the tube. This didn't seem an unreasonable expectation, given that human lips as well as other sorts of reeds do so, and all of them are heavier and less compliant than balloon lips. As a practical matter it is easy to attach a labial reed to an air tube: one need only cut off the body of the balloon near the base of the neck and stretch the opening over the end of the tube. One can then pinch the neck with both hands somewhere near its midpoint and pull it apart just as you would to make a balloon squeal, while blowing through the mouth of the balloon (illustrations overleaf). In this way it is possible at least to try out the general principle; later on one could consider how to create an adjustable no-hands balloon pincher mechanism, leaving the hands free to cover tone holes or whatever.

Now, I still think that this labial reed idea has potential. However, I must report that in the limited work I did with it, the results were not very rewarding. There are many possible reasons for this. So why didn't I pursue it farther at the time? Because I kept getting distracted by something else – a balloon reed configuration that immediately produced much more musical results.

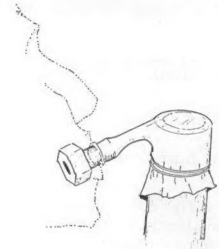
I found that if the balloon neck is pulled over the rim of the tube (as shown in the second drawing), a different sort of gating system is created that can take the place of the pinching of the neck.

When the player blows into the balloon mouth, the air must squeeze its way under the taut balloon rubber and over the tube rim, thence into the tube – it has nowhere else to go. This squeezing-under business it does, it turns out, in pulses:



Left: LABIAL REED, in a crude and simple arrangement. The cut-off neck of a balloon is fastened over the end of an open tube, while the mouth of the balloon is held in the player's mouth. It is shown here connected to an inexpensive plastic plumbing fixture whose shape allows the player to hold it behind the teeth, preventing it from slipping out of the player's mouth. Initial experiments with this arrangement didn't prove especially effective from a musical point of view. Should we conclude that it is an inherently flawed idea, or does it yet hold some potential?

Right: MEMBRANE REED, in a simple but effective configuration. Again using the plumbing fixture to make it easy to hold the mouth of the balloon behind the teeth, the player blows through the neck of a balloon stretched over the end of a tube. The neck is held at and angle such that, to enter the tube, the air must squeeze between the balloon membrane and the rim of the tube. This it does in pulses, setting up a standing wave in the tube.



the balloon rubber lifts to allow a burst of air through, then comes back down under its own elastic pull. The pressure wave created by that original pulse travels the length of the tube, is partially reflected back and returns to the balloon end of the tube, where it helps to lift the balloon again, allowing another pulse through. As long as the air stream continues through the mouth hole the cycle is repeated, at a frequency corresponding to the resonance frequency of the tube. In short, the system behaves exactly as a wind instrument reed should!

This general arrangement is my version of the membrane reed. It is similar in principle but quite different in configuration from the Indonesian form. Since I initially happened upon this system I have done some further experimentation, arrived at some refinements and built a couple of instruments. The basic configuration speaks wonderfully easily and can produce a very good tone. It generally does not sound unique or in any way strange; in fact people often compare it to existing wind instruments – but with no consistency: listeners have likened it to virtually every orchestral woodwind instrument. The tone quality very much depends, of course, upon what sort of air column shape is being used, as well as a host of factors affecting the reed itself. The sound emanates primarily from two distinct points on the instrument: 1) the highest open tone holes (or, if none are open, the far end of the tube) – which is typical for reed instruments – and 2) the surface of the membrane itself. The tone from coming directly from the membrane tends to be brighter than that coming from the tonehole, and sometimes buzzy.

Despite the system's initial co-operativeness, it has proven difficult to domesticate for musical purposes. This is not surprising – after all, people have been refining the designs of the standard reed instruments for a thousand years. The biggest difficulties for membrane reeds have been in the area of pitch control. The sounding pitch, while primarily determined by tube length, is also subject to several factors affecting the reed. This is true of all reed instruments, of course: the player can force the sounding pitch up or down by techniques which alter the effective stiffness of the reed, or by varying vocal cavity resonances. With these stretchy membrane reeds, however, the effects are multiplied to a point where pitch stability can become a problem.

There are two main sources of intonational instability: 1) the player can greatly increase the stiffness of the membrane by making it more taut, so that slightly pulling on the neck may drastically raise the pitch. (This can variously be done during playing by stretching the mouth piece on the balloon neck farther away from the tube edge, or by altering its angle of approach). In addition, the length and rigidity of the section of balloon neck leading up to the rim of the tube – factors which can be altered quite a bit by stretching or slackening during playing – affect the resonant properties of that enclosed air space, which in turn has its effect on the membrane reed behavior. 2) Blowing harder usually has the disconcerting effect of flattening the pitch considerably: apparently restoring force on the stretchy membrane does not vary in a linear fashion with amplitude, so that as the membrane vibrates increasingly vigorously it fails to spring back quickly enough to maintain a constant frequency.

Either of these two factors (the sharpening effect of increased tension or the flattening effect of forceful blowing) may cause the pitch to bend as much as a minor third. Fortunately the player can use the two effects to offset one another. One can stay in tune while playing fortissimo by stretching the reed enough to counteract the flattening effect of over-forceful vibration. Were someone to devote the amount of time to this instrument that professionals normally devote to established instruments, this compensation might become second nature; not only that, but the freedom afforded by such a wobbly instrument would surely become a great expressive virtue. As an added advantage, the pitch change associated with changes in reed tension means that the instrument can easily be tuned by adjusting the reed and its mounting. Still, it must be said that at this point in my explorations with membrane reeds, the problem of pitch instability remains a serious one and has prevented me from making an instrument that I find fully satisfactory.

Membrane reeds can be designed to work over a large pitch range, from the contra-bass region to mezzo-soprano. The size of the membrane itself becomes a factor here. Normally, if only as a matter of convenience, the diameter of the membrane will correspond to the diameter of the sounding tube for the pitch range in question. For typical wind instruments in the soprano range, internal tube diameters near the mouthpiece end range (very roughly) from perhaps 1/4 to 5/8 inches, since these small diameters are what work well with the relatively short soprano tube lengths. Problems may arise for membrane reeds in the highest musical ranges because it becomes difficult to create an effective membrane over these small diameter openings. On the other hand, where longer tube lengths allow it, one can create membrane reeds of very large diameter -- like two, three, four or more inches. A membrane reed over a six foot length of four-inch diameter sewer pipe produces an impressive sound indeed. It's quite

something visually as well, since the large membrane can be seen vibrating with amplitudes of a half inch and more above and below the rest point. Not surprisingly, relatively large, heavy weight balloons work best in such applications. They tend to be more stable in their patterns of oscillation (less prone to jump to the higher overtones), and of course they don't break as easily.

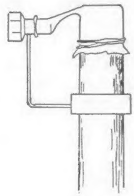
It's also quite possible to make short fat membrane reed instruments, with three or four inch diameter membranes over tubes of less than a foot in length. With these, pitch control becomes more difficult and one loses the option of creating tone holes for different pitches. Such instruments will speak though, and often with a nice tone. With them, and to some extent with instruments of longer air columns, one can try a different approach to pitch control: instead of using tone holes or other means to change the effective length of the air column, one can focus on pitch and timbral variations achieved by control of the reed. Reed control may come through the stretching effects described above, plus the player can experiment with using the free hand to press the large vibrating membrane itself at different points and with different pressures. The range is limited, but the possibilities are still quite enjoyable for something so easily made.

We should take note that the presence of a membrane reed affects the resonant frequency of a given tube length, producing a result that is different from either a rigidly stopped end or an open end. The softness of the membrane lowers the sounding pitch as compared to what it would be with a rigidly stopped tube of the same length. This is true of all reed instruments, but the effect is exaggerated by the greater compliance (softness) and larger surface area of the membrane reed as compared with other reeds types. Tube length calculations and tone hole spacings that work with other instruments will have to be modified for membrane reeds.

Descriptions of membrane reed instruments I have made, plus diagrams of some of the other workable reed configurations, appear below.

And now, with a basic understanding of the workings of membrane reeds under our belt, we turn to the Indonesian instrument.

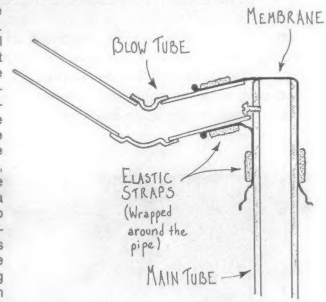
Diagram at left below: A FIXED POSITION SYSTEM for the simple membrane reed set up shown on the preceding page. Because changes in tension at the balloon's neck cause considerable detuning of the sounding pitch, it helps to stabilize the position of the mouth piece. An easy way to do this is through a flexible steel support. Using a spring-tempered steel rod allows the player to flex the position for pitch bending and vibrato, confident that it will return to an unchanging default position to assure a consistent pitch basis.

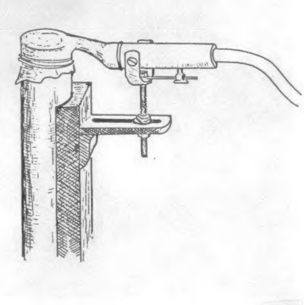


Photograph: ALTO MEMBRANE REED INSTRUMENT. A fourteen inch sounding tube with eight tone holes gives this instrument a range of an octave, starting at G below middle C. The tone holes alone produce something less than a chromatic scale, but by flexing the reed one can fill in the spaces between. The tone is warm, not bright, and somewhat reminiscent of the upper register of a clarinet.

Diagram above right: THE BLOW TUBE/MEMBRANE ARRANGEMENT USED ON THE ALTO MEMBRANE REED INSTRUMENT. In this arrangement, the balloon membrane serves the additional function of holding the blow tube in place, with its position checked by a screw protruding from the main tube. Elastic straps with velcro fasteners wrap around to hold the balloon on both the blow tube and the main tube. Tension on the membrane can be altered during playing by rocking the blow tube down a bit, which has the effect of increasing the space between the top part of the rim of the blow tube and that of the main tube. This turns out to be a natural and easily-mastered performance technique.

Diagram below right: THE BLOW TUBE/MEMBRANE ARRANGEMENT USED ON A BARITONE MEMBRANE REED INSTRUMENT. I have done some work on a baritone membrane reed instrument, but remain far from any satisfactory result. I alternate between being thrilled by the richness and clarity of tone that is possible with a simple tube and reed, and disappointed in the results when I work toward extending the range. (Much of the problem here lies not in the reed, but in the toneholes. I've been trying to create a workable tonehole keying system capable of handling many toneholes covering a large chromatic range, which can be created in a home workshop with ordinary tools. It has proven difficult and I can't claim much success at this time.) I envision the baritone membrane reed instrument being laid horizontally on a table before the player, with a keyboard-like arrangement for the tonehole keys. To accommodate this, I have had to provide the baritone instrument with a long, flexible blow-tube to allow for more remote blowing. The flexible tube leads to a short section of rigid pipe in a fully adjustable pivoting arrangement. The player can set its angle and distance from the main tube rim prior to playing, which is good for tuning and overall adjustment of the reed. Then, during performance, the player can practice fine tuning, pitch bends and vibrato by using the left hand to pivot the short rigid pipe. The small upright rod visible to the right of the rigid part of the blow tube is in effect a large needle spring of tempered steel rod; it assures a consistent default position for the reed.





INDONESIA

The Indonesian instrument actually came to my attention before I began my own experiments with balloon reeds. Robin Goodfellow, a frequent contributor to EMI who always seems to come up with such things, showed me a couple of them. She had gotten them from Saul Robbins, a friend who had recently returned from that part of the world. Here is Saul's description of his coming upon the instrument:

Last year my companion Erin and I travelled around the world. Indonesia was our first country and Sumatra our third island to visit. Part of the time there was during the month of Ramadan, the fasting month, which is a time to test one's devotion to Allah by fasting from sun up to sun down. Needless to say it is a tough test, made even more difficult by the need to continue working, driving vehicles, and so on. There were many stories told about buses careening off the road from the driver's lack of stamina.

Having survived most of the month's excitement we settled into the small mountain town of Beregstagi in Northern Sumatra to climb a well known volcano and to enjoy the end of Ramadan which would be marked by plenty of excellent food, good humor, and some local rock and roll. We spent that day wandering around the town, talking and laughing with the locals as they enjoyed eating in daylight once again. A favorite picnic spot was up on a hill overlookling the town, where one could rent a mat so as not to spoil his/her clothing, and enjoy fresh corn on the cob and home-made ice cream.

It was here that we noticed several people selling these little flutes. What first drew me to them was not the sounds they emitted but more the inventiveness of the materials. My college and graduate training was in art and photography, and I have always been interested in post photographic uses for all those little plastic canisters. Here, thousands of miles away from home, was a quite inventive approach to the evil legacy of plastics.

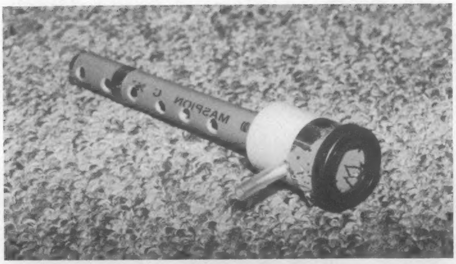
The entire flute is or can be made from salvageable plastics: 1/2 inch pipe makes the flute, with a few holes drilled for finger holes. An empty film canister makes the air chamber, and a piece of tubing is fitted into the side for a mouthpiece. A piece of balloon is then stretched over the top of the canister and the lid — which has been carved out — is snapped down to hold it taut. A few adjustments are then made to find the right distance from pipe to balloon for proper resonance and you have a lovely, deep bassy sound. Perfect for serenading a loved one after eating.

To learn more about the instrument and cultural context, I contacted Jack Body at the University of Wellington, New Zealand, who maintains an interest in Indonesian folk and children's instruments. He wrote back:

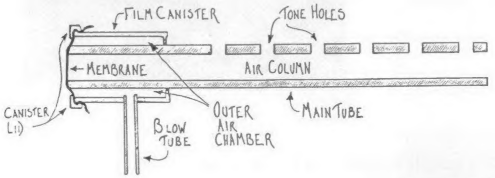
I do have a similar instrument myself, which, if I remember correctly, I bought during a Sekaten festival in Yogyakarta in 1976 or 77. In showing it to Indonesian friends they simply say "Oh yes, it's just one of those types of children's noisemakers." And indeed in Indonesia there are many such ingenious inventions for children to make noise with. It is a remarkable design, though I would say it is simply a relatively recent invention, not derived from any traditional model or adult instrument that I know of. And like so many similar instruments, mine is made of scrap materials. The main chamber is an old film canister with its cap on, though with its center section cut out. The membrane is actually plastic wrapper which after all this time is still intact and totally functional. The mouthpiece is of transparent plastic and the protruding pipe of grey pvc. There are six holes which comfortably suit three for each hand. It seems to me the holes are distanced arbitrarily, the end one being rather close to the end of the pipe, thus effecting little change in pitch. I suppose I

THE MAKER OF MEMBRANE REEDS WITH SAUL ROBBINS IN BERSTAGI, SUMATRA. Saul writes, "You can see the flutes in the foreground as he stores them before 'final assembly'. Also notice the woman and child [in her lap] with flute in hand, beginning early."

Photo © 1989 by Erin Dawn



THE INSTRUMENT PURCHASED BY JACK BODY IN YOGYAKARTA, JAVA, IN 1976 OR 1977, showing the white film canister and the cellophane membrane held fast under the cut-out canister lid. (Note also the exotic notations on the main tube -- a result of the original photographic print having been unintentionally reversed).



CROSS SECTION DIAGRAM OF THE INDONESIAN MEMBRANE REED. When the player blows into the blow tube, air enters the outer chamber, and from there is forced to squeeze under the membrane and into the main tube air column.

should have been more curious at the time I purchased it, but on other occasions I've found it difficult to get factual information — the sellers are suspicious of one's curiosity.

To pull some of this information together, we appear to have here an informal or children's instrument – albeit, a remarkably clever and inventive one. It's been around in fairly stable form for at least the fourteen years or so since Jack Body purchased his model, and given that Saul Robbins picked up his just last year, it appears still to be going strong as a popular instrument type. It's geographic distribution is not all that narrow, since Yogyakarta, where Jack saw the instrument, is in central Java, roughly a thousand miles as the seabird flies from Saul's mountain town in northern Sumatra. No one that I have spoken to has been able to point to any traditional instruments employing the same sound production principle, so we may here have come across an instance of a relatively rare occurrence in organology: the spontaneous appearance of a new species – but this remains speculative. I might add that at this point I still haven't even learned the Indonesian name for the thing, or indeed whether it has a formal name.

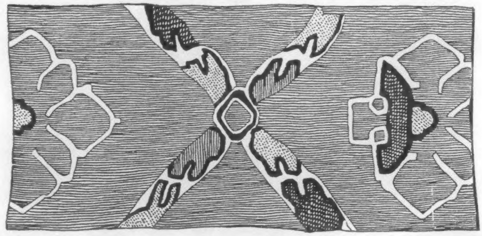
And now, for a fuller description:

As the diagram shows, the instrument uses a main air column tube, with the modified plastic film canister described by our correspondents slipped over one end. To make this possible, the bottom of the canister has a hole cut in it, allowing it to fit snugly and air-tight over the main tube. The diameter of the pipe and canister are such that an air space of perhaps an eighth of an inch remains between the two all around. The snap-on top of the canister also has a hole cut in it, but of larger diameter than the main pipe. The membrane – balloon or cellophane – goes over the open end of the canister, and is held in place when the canister lid is snapped on over it. The whole canister can then be slid down along the main pipe to a point where the end of the pipe would, were it not for the membrane, begin to poke out through the larger hole cut in the lid of the canister. Instead, in this position, it exerts pressure on the membrane and stretches it slightly as it pushes it outward. A small blow tube set snugly into a hole drilled in the side of the canister allows the player to direct air into the enclosed space between the canister and the main tube.

The operative differences between this membrane reed system and the arrangements described in the first part of this article lie in the air path by which air is forced under the membrane. When the player blows through the short mouthpiece tube, pressure builds up in the air chamber formed by the canister around the main pipe. One boundary of this chamber, as can be seen in the diagram, is in effect a ring-shaped section of the membrane. The pressurized air, having nowhere else to go, forces the membrane up and scoots underneath. Thus it escapes in rapid pulses into the main pipe, exactly as it does with the other membrane reed arrangements described earlier.

The system is somewhat reminiscent of the early European reed cap instruments, or the reed pipes used in bagpipes, in that an air chamber intervenes between the player and the reed, and the only control the player has over the reed is through air pressure variation. The main adjustment to be made in getting the system to work well involves sliding the canister forward or backward along the main tube by small amounts. This has the effect of tuning the tension on the membrane, since it varies the amount that the main tube extends beyond the film canister end, and therefore how much it pushes outward on the membrane. The system as a whole is remarkably effective, in that a properly adjusted instrument speaks without hesitation, with a loud, full-bodied tone and well-defined pitch.

ACKNOWLEDGEMENTS
Thanks for assistance with this article go to Robin Goodfellow for first showing me the Indonesian membrane reed instrument;
Saul Robbins for providing background information on the Sumatran version, and Erin Dawn for the associated photograph; and
Jack Body for photograph of and background information on the Javanese instrument, and general insight into Indonesian children's instruments.

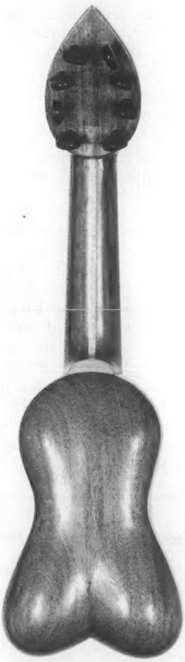


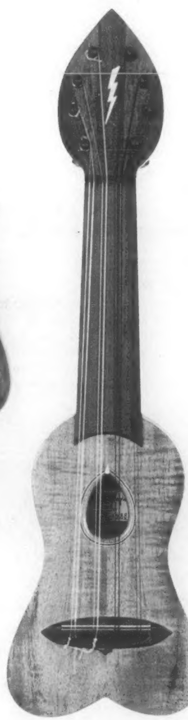
UKEFUL IDEAS

by Brian Stapleton

Brian Stapleton makes and restores ukuleles and other string instruments, both traditional and original, at his work shop in London.

My introduction to the art of lutherie was about 10 years ago when I started making a guitar at evening classes. After four years, it was finished. Encouraged by the immediacy of this pastime, I went on to make two more before being accepted by the London College of Furniture to study violin making. It was while I was there that I was introduced to George Hinchliffe and ukulele cohorts, and the Ukulele Orchestra of Great Britain came into being. Due to a lack of playable instruments (which did not stop the embryonic uke orch) it was necessary to design and make instruments for the band.





Above and right: The **camilita**, front and back views, modeled on a little known Polynesian instrument. Scale length 12.50"; at present tuned e'eb'be'e'b'b'.

I am still using the initial model of uke that I designed at that time, although various modifications have since been introduced. These are mainly concerned with strength: the band members tend to use regular nylon guitar strings at higher tension played with a high element of thrash, so the ukes needed to be more robust than traditional models. There is also quite a lot of solo single note instrumentation with the band's material which demands a design closer to a small guitar.

My choice of materials depends largely on availability. Sometimes the inherent properties of the wood will suggest a design, and nothing attractive or resonant will be rejected. Where possible, I recycle materials and I also try to avoid non-renewable resources.

In addition to the instruments shown in the photographs here, I have made, among others, the arachnapatch – an 8 stringed spider-shaped sopranino ideal for playing tarantellas – and the lozarhythm, a big cousin of the flying arrow with the lower corners removed to create a lozenge-shaped body.

At present I am working from Waterside, a group of cooperatively run workshops in south London where I restore stringed instruments and make to commission. I am researching the aeolian harp, and have made a working prototype. I would welcome any information from readers on this subject. I am building a quelele (baritone ukulele) for a member of the uke orch, and working on ideas for musical clothing accessories. I am also compiling an album of material for The Ulterior Consort, an occasional flexible music ensemble. Future plans include small steel-string guitars, electric lap steels, mandolins, and possibly more ukuleles – perhaps a twin neck or a harp ukulele.

I would be interested to talk to other readers/instrument builders, so please call or write me at 99 Rotherhithe St., London, SE16 4NF, UK; phone 071-237-0017.

Left:
The **taroplank**, maple back and ribs with a spruce top and a cloudburst finish. Scale 20.25";
tuned d'd g'g b b e'e'.

Below:
The **flying arrow**, based on a martial arts weapon, made of rock maple. Scale length 14.75"; tuning d" g' b' e".

Facing page, top right:
The author with **Les Cool** (a mando-tuned uke) and **Camelita**

Thanks to Sarah Franklin, 78 Lauriston Road, London E9, for the photographic evidence, and John Cole and his Mac for the spelling.

THE DEVIL'S FIDDLE: PAST AND PRESENT

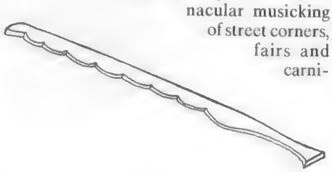
By Hal Rammel

This article will appear in two parts. Part One explores the history and curious culture of the Devil's Fiddle, while Part Two, slotted to follow in the next issue of EMI, presents the work of several recent individual makers.

PART ONE

The devil's fiddle is a one-string percussion instrument more commonly known in Europe and England as the *bumbass* (German) or *bladder and string* (England). In the United States, devil's fiddle is probably a more familiar name, but this too has origins in the German *Teufelsgeige*, devil's violin. The bumbass is basically a stick zither, consisting of a vertically held pole four to six feet long, sometimes with a small pair of cymbals fixed to the top. A string stretches the length of the pole across a resonator (animal bladder, gourd, small drum, wooden box, or metal canister) mounted to the pole near the bottom end. The string is bowed with a notched stick to create a drum roll effect and the pole hit against the ground to sound the cymbals, bells and other noisemakers that may be fastened to the pole. More elaborate variations add other percussive effects such as small pellet bells, woodblocks, cog rattles, bicycle horns and bells, sleigh bells, etc., and for more comical non-musical effect, a small carved head (e.g. devil's head) may be mounted at the top of the pole just below the cymbals. The variations on this simple design are remarkable and will be surveyed in the course of this article.

The origins and development of the bumbass are sufficiently obscure as to defy historical chronology. The oldest known descriptions of the instrument have the same features identified with the more elaborate versions we know today. This is most frequently a homemade instrument, a significant factor contributing to its ephemeral stature. Additionally, the bumbass and its players occupy positions at the margins of documented musical activity, in the vernacular musicking of street corners, fairs and carnivals, and in the musical play of children. Nonetheless, we know that these instruments had a wide distribution throughout Europe, into Russia, the British Isles, and America, as evidenced in the number of names linked to the instrument: *basse de Flandre* (Flemish), *bumba* (Iceland), *luk muzycyny* or *optopka* (Poland), *smyk* (Russia), *bandurka* (Ukraine), *blaze-vere (Belgium)*[1], *ozembuch* (Czechoslovakia), *rabel* (Spain), *turututela* (Switzerland), *rumsterstang* or *krigsdjaevel* (Denmark), *Saugeige* or *Saubass* (Austria), *drone* or *humstrum* (England), *Stumpf Fiddle* or *pogo cello* (United States) to name only a few.[2] Karl Peinkofer and Fritz Tannigel in their **Handbook of Percussion Instruments** call it "the oldest and most primitive form of one-man percussion band."[3] However, "primitive" here seems to refer to a crude or rustic simplicity, since the particular instrument shown to illustrate their note was made in Germany at the turn of the century and these instruments may still be heard today on the streets of Vienna, alongside the "more civilized" harmonica and accordion.



FIGURES 1 & 2: A Czechoslovakian bladder and string, or ozembouch (approximately six feet tall); and the notched bow that goes with it.

Variations on the stick zither and various one-string instruments are found throughout the world's musical cultures. While one string stretched the length of a stick seems just about as basic as can be imagined, for a string instrument the number of ways such a string might be sounded is remarkable, and the variety of music produced even more astounding. As a vertically held pole of often very comical design, the bumbass is distinguished by its predominantly percussive function in solo and ensemble performance, nurtured by the pole's transformation into percussion stick. This survey will focus on European and Euro-American varieties of the instrument. I have no doubt that such instruments have found their way into Afro-Caribbean and African-American musical traditions, but I simply have no references or examples to offer.

The earliest description of a bumbass (other than references to the *bumba* in Nordic sagas) appears in an Icelandic lexicon from the 1600's, describing a bladder and string with two bladder resonators and two strings scraped with a wooden stick to produce a "dull sound." Pellet bells and jingles

provided additional sounds. There are scattered depictions of these instruments in some Flemish paintings of tavern scenes. Jan Steen's "The Serenaders" (mid 1600s) shows a bladder and string played in a trio with flute and lute (Fig. 2a), and reportedly, one of Hogarth's series of paintings, "The Beggar's Opera," includes a bladder and string player. An engraving of Singing Sam of Derbyshire, a street performer of 1760, appears in L. Jewitt's **Ballads and Songs of Derbyshire** (1867) playing the most basic sort of bladder and string, a shoulder height pole with a large bladder held tightly between the string and the pole near the lower end. He plays it with a simple homemade string bow as drone accompaniment to his singing.[4] Ritson's **Observations on the Minstrels** reports on a London street musician observed playing something similar using a canister as a resonator. The musician called this instrument a humstrum, although humstrum more often refers to a homemade English variety of rebec with four strings drawn across a canister resonator.[5]

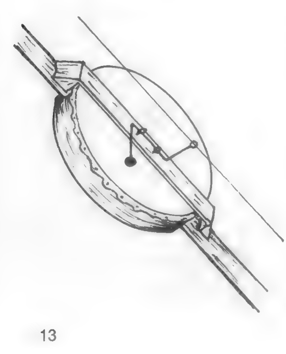
FIGURE 2a (below):
Bladder and string depicted in Jan Steen's "The Serenaders"

FIGURE 3 (right):
Bumbass, a model sold through Armin Voigt's catalog, Germany, late 1800s.
(Photo courtesy of the Munich City Museum.

The turn of the century marks the first known commercially made variations on the bumbass. The instrument appears in the sales catalog of Armin Voigt (1900-1929) of Markneukirch, Germany with the following description of how it should be played: "like a Double Bass without however fingering the string. While playing, the Instrument is struck down upon the floor in time with the Music, thus causing the Cymball and Bells to ring, while the drawing of the Bow across the String brings forth a sound similar to the roll of a Drum."[6] Here a new feature has been added (likely drawn from homemade varieties) dramatically heightening its comic appearance. A carved head sits at the top of the pole just below the cymbals (the pole gradually widens near the top to accommodate the peg box, then curves to suggest shoulders and neck). Several types of carved heads were available: clown, farmer, impish child, monkey. An animal bladder functioned as the resonator, held by the string (without a bridge) against a flat round board fixed to the pole near the bottom. Armin Voigt seems to have marketed several models of the instrument and/or made various changes over the years. The bumbass pictured in Fig. 3 has pellet bells held vertically in a tree-like arrangement, while the instrument depicted in Voigt's catalog (Fig. 4) shows pellet bells hanging from the lower cymbal at the top of the pole. A very similar looking bumbass (from the Crosby Brown Collection of Musical Instruments, 1889) pictured in Fig. 5 (overleaf) has an openwork metal lyre fastened to the back of the neck just below the pegbox with five pellet bells hanging from it. This was reportedly advertised in C.G. Conn's catalog in the late 1800s, selling for between $17 and $24 depending on how detailed the clown's head was carved.

FIGURE 4 (above):
Illustration from Armin Voigt's catalog.

FIGURE 6 (below):
Wire mechanism common to many 20th century bumbasses.



At some point in its commercial development, a new mechanical innovation appears in the arrangement of string against resonator. Instead of a string stretched tightly over the resonator with no bridge, the animal bladder resonator has been replaced with a small drum. The movement of the string is communicated to the drum by a piece of wire. The string passes through a loop in the wire (see diagram in Fig. 6) and the wire hinges on a strip of wood passing above the drumhead. At the top end the wire bends 90° laterally

to end in a ball that raps the drumhead as the bow's teeth pull then release the string. Thus, as the toothed bow scrapes the string, the mallet repeatedly strikes the drum for a rapid, though brief in duration, drum roll. When and how this innovation took place is unknown, but it certainly existed as a regular feature near the turn of the century in commercially made German bumbasses.

Into the 20th century, we find these instruments fueled equally by commercial and homemade invention and innovation. Before passing on to more contemporary examples, other influences on the development of the bladder and string may be noted, demonstrating several ways in which the bumbass blended with other instrumental forms.

Francis W. Galpin in his **Old English Instruments of Music** remarks on the bumbass' similarity to another curious bowed chordophone, the tromba marina.[7] Of equally obscure origins (it first appears in a French sculpture in the 12th century), the tromba marina's single string was mounted on a long, slowly tapering body and bowed just below the nut but above where the string was touched by the player's finger. Galpin suggests the tromba marina and bumbass may have common origins in a drone bass of greater antiquity. However, in addition to producing a drone effect, there are several other parallels Galpin overlooks. The tromba marina has been depicted being played in two different positions: with the wide end of the triangular body resting on the ground and the upper end resting on the player's shoulder, or with the entire instrument pointed upward over the player's head. While the bladder and string is most often held with the resonator end toward the ground, there is an Italian bladder and string player from 1759 pictured in Pougin's *Dictionaire du Theatre* (1885) playing the instrument in a reversed position, i.e. with the bladder and stick high in the air, bowed at waist height.[8] The most curious and characteristic part of the tromba marina is its drumming bridge, an asymmetrical bridge with one vertical foot supporting the string and a second shorter foot a bit to the side and allowed to vibrate loosely against the soundboard. This trembling bridge gives the sound a more brassy timbre, thought to be the origin of the trumpet reference in the name. This unusual feature (such built-in drumming devices are uncommon in Western instruments) appeared toward the end of the 15th century, long before the drumming mechanism of the 20th century bumbass. However, they have a remarkable mechanical similarity. Depictions of the tromba marina, often in the hands of angels and virgins, date several centuries earlier than any pictorial appearance of the bladder and string, before the lives and music of lower classes became acceptable material for painters and engravers. The tromba marina certainly does not appear to have been the instrument of street corners and taverns like the noisy bumbass. Oddly enough, that the bumbass may be the tromba marina's disreputable, street corner cousin is further suggested by one of the tromba marina's German names, *Nonnengeige*, or nun's violin. Perhaps the name *devils violin* was someone's humorous reference to the instruments' religious vs. secular overtones. If they indeed shared a common origin and parallel development, the tromba marina may be a refinement of the specific droning qualities of the bladder and string. However, this would predate considerably any knowledge of the history of the bumbass.

With the addition of various noise devices to the bladder and string's pole (as in the Icelandic *bumba*), the instrument begins to resemble a percussion stick, extending its percussive possibilities in the direction of one-man band style performance. Another percussion stick of exceptional ornamentation appeared in Europe in the 16th century in the form of the Turkish crescent, a tall pole topped with a Muslim crescent decorated with bells, jingles, and horsetail plumes. It was adopted from the Turks by European military bands in the late 1700s. In England, it became known by the equally exotic name Chinese pavilion, or more simply, the Jingling Johnny, a corruption of the Turkish name *chaghana*. It is not difficult to imagine the noisily bedecked bumbass as an absurd parody of the Turkish crescent's more formal position leading marching bands in

FIGURE 5: German Bumbass from the Crosby Brown Collection of Musical Instruments
(Photo Courtesy of the Metropolitan Museum of Art)

the late 18th century when Turkish "Janissary" music spread throughout Europe. Surmounting the pole with an outrageously carved head (in place of the crescent's regal ornamentation) heightens the instrument's clownish character as it stands eye to eye in duet performance with the musician like the fool's head sitting on top of the jester's wand or scepter in earlier times.

In more recent decades in the United States (as will be seen later in this article), we find the addition of horns, cowbells, jingles, washboards, and assorted drums to American varieties of the devil's fiddle. These suggest the assemblages of washboards and homemade percussion kits reflecting the influence of African-American attentiveness to the musical possibilities of everyday objects and affection for untempered but carefully selected sounds.

In the second half of this article, appearing in the next issue of this publication, we will turn to a few widely scattered but delightful examples of the bumbass and its kin as further demonstration of this simple instrument's marvelous diversity.

FOOTNOTES

1.Ferd. J. De Hen, "Folk Instruments of Belgium: Part 1," **The Galpin Society Journal** 25 (July 1972), pp 110-111. See photo plate XC.

2.See listings in Sibyl Marcuse's **Musical Instruments: A Comprehensive Dictionary** (New York: W.W. Norton & Company, 1975).

3.Karl Peinkofer and Fritz Tannigel, **Handbook of Percussion Instruments** (New York: Schott, 1969) pp 169-170.

4.Reprinted in **The New Grove Dictionary of Musical Instruments**, Stanley Sadie, ed., (New York: Grove's Dictionaries of Music, 1984), Vol. 1, p 285. See also Bart Hopkin, "Balloons & Bladders," **Experimental Musical Instruments** Vol. V #4 (December 1989).

5.Francis W. Galpin, **Old English Instruments of Music: Their History and Character** (1910, repr., New York: Barnes and Noble, 1965), pp 63-4, Plate 14.

6.Quoted in Anthony Baines' "Bumbass," The New Oxford Companion to Music, Denis Arnold, ed. (Oxford: Oxford University Press, 1983), Vol. 1, p 283.

7.Galpin, **Old English Instruments**, pp 72-4.

8.Sibyl Marcuse, **A Survey of Musical Instruments** (New York: Harper and Rowe, 1975), pp 186-7.

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FAMOUS 20TH CENTURY COLOR INSTRUMENTS

by Kenneth Peacock

This article continues the historical account that began with Ken Peacock's essay, "Famous Early Color Organs" appearing in EMI's September 1991 issue.

COLOR INSTRUMENTS DEVELOPED AFTER SCRIABIN'S *PROMETHEUS*

Many reviewers of Scriabin's color-symphony have remarked that the first performance of **Prometheus, the Poem of Fire**, given in Moscow on 15 March 1911, did not include color realization because the machine to perform the lighting part would not operate. Additional information has not been located, but it seems reasonable to assume that if such a machine did exist, it was probably a larger version of the model constructed by Scriabin's friend Mozer. Apparently no expense was spared for the original production of **Prometheus** as Serge Koussevitsky gave the work an unprecedented nine rehearsals. It is puzzling, if such an instrument was available, that no attempt was made to use this *Tastiera per luce* in subsequent performances.

The first public presentation of Scriabin's symphony accompanied by colored lighting (20 March 1915) was in Carnegie Hall. According to a report published in the **New York Times** the day before the performance, Modest Altschuler had contacted the president of the Electrical Testing Laboratories for assistance in realizing the color portion of **Prometheus**. Preston S. Millar, a specialist in electrical lighting, had been assigned to supervise construction of a color-projection instrument later named the *Chromola*.

Two versions of the Chromola were built over a period of three months, and "thousands of dollars were spent before the project was completed." Special lamps were manufactured by General Electric as the instrument projected twelve separate colors. It was operated from a keyboard with fifteen keys – the extra keys repeated the first three colors of the scale. When key contacts were closed, a low-voltage DC circuit activated the 110-volt AC circuit to one of the projecting lamps. Unlike previous devices, this machine was not built to demonstrate a particular association between color and sound. It was intended solely for performances of **Prometheus**.

A problem was quickly encountered because there is no indication of appropriate colors for the luce part given in Scriabin's score. Six years after the first effort to present **Prometheus** with co-ordinated light, colorist Mathew Luckiesh wrote:

> Some of those responsible for the rendition of this music, with color accompaniment, had, at different times previous to the final presentation, accepted both the Rimington scale and Scriabine's code (the latter having been discovered later in a musical journal published . . . in London) as being properly related to the music.

Modest Altschuler's Carnegie Hall production of **Prometheus, the Poem of Fire** generally met with disfavor. One critic dismissed the colored lights, which were flashed onto a small white screen, as a "pretty poppy show." For various reasons, the Chromola was considered one of the instruments of the orchestra rather than equal in effect to the combined instrumental and choral forces as Scriabin intended. The audience also evidently expected more. Technical problems contributed to difficulties, and not enough time was allowed for an artistic setting. Inappropriate theater facilities further diminished the possibility of a successful color realization.

A report in the **New York Times Magazine** (28 March 1915) indicated that an apparently successful, private presentation of the color symphony accompanied by the Chromola took place at the Century Theater "about February l0th." Members of the distinguished audience included Isadora Duncan, Anna Pavlova, and Mischa Elman. On that occasion, Millar (the inventor of the color-instrument) was quoted as saying:

> It was my dream to utilize an entire theatrical stage, hanging parallel curtains of thin diaphanous gauze from the proscenium, back to the rear wall of the theater, thus giving the light depth and sufficient space to expand and create atmosphere.

According to Luckiesh, others suggested that colors be projected onto loose folds of material, "kept moving gently by electric fans placed at a considerable distance." Had such solutions been adopted, the world premiere of Scriabin's **Prometheus** with color realization would have undoubtedly received a better press.

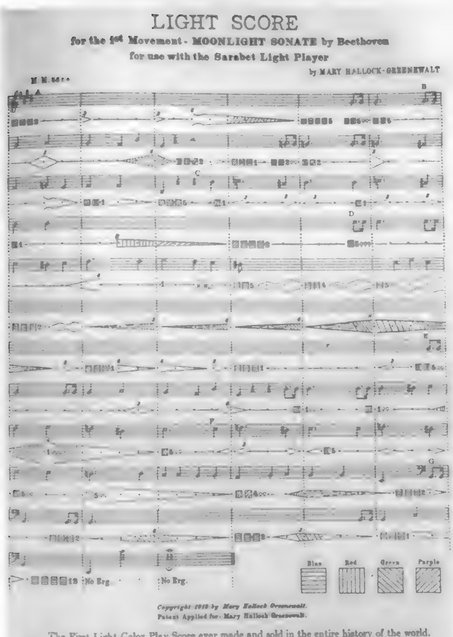
In the years following Altschuler's rendition of **Prometheus** with colored light, a great number of "color-organs" appeared. It may be difficult to prove a direct link to the color symphony, but Scriabin's composition must have encouraged these developments.

While Castel's eighteenth-century *clavecin oculaire* and nineteenth-century innovations such as Rimington's Colour-Organ had been conceived to reveal physical connections between light and sound, most instruments built during the early decades of this century were not intended to express direct association. One exception, however, was a device invented in 1912 by an Australian named Alexander Hector. On his instrument yellow corresponded to middle C – a pitch associated with red by Rimington and blue by Castel. This frequent difference of opinion concerning "correct" color associations prevented the establishment of a consistent aesthetic for performances of color-music. If the same musical composition was performed on separate instruments (Rimington's or Hector's for example) the resulting translations would yield entirely different colors.

By the early 1920s it became apparent that there was no indisputable correspondence pattern between colors and sounds. For this reason, many predicted the evolution of a new and independent art form – pure light manipulation which had no connection to sound. Experimenters attempted to resolve technical difficulties, and most seem not to have been aware of the work of others in this very old field. Nearly

Fig. 5A (left): Mary Hallock-Greenewalt at the console of her **Sarabet** (1919). A sliding rheostat controlled reflection of seven colored lights onto a monochromatic background.

Fig. 5B (below left): Mrs. Greenewalt's patented system of light notation indicated subtle variations of luminosity which were parallel to nuances in musical expression. This Beethoven composition was originally for solo piano.



The First Light-Color Play Score ever made and sold in the entire history of the world. Reproduced out of the author's Patent No. 1,385,944 for Notation for Indicating Light Effects.

every color-organ inventor in the nineteenth and early twentieth centuries was under the delusion that he was the first to conceive of color-music. Mary Hallock-Greenewalt is perhaps the extreme example. Her book is a self-panegyric in which she claimed in the opening pages, "It is I who have conceived it [color-music], originated it, exploited it, developed it, and patented it." She concluded (over 400 pages later) that the art she named "Nourathar" – an arbitrary combination of two Arabic roots – is an aid to better health. Thus her conception of a medicinal use for art anticipated by over half a century the philosophy of today's New Age practitioners.

Mrs. Greenewalt's apparatus for the performance of color-music was named the *Sarabet* (after her mother, Sara Tabet). In 1919 the machine was demonstrated for the first time. Her elaborate instrument was operated from a small table-like console (Fig. 5A). A sliding rheostat controlled reflection of seven colored lights onto a monochromatic background. In her concerts of light, Mrs. Greenewalt emphasized variation of luminosity which she considered parallel to nuances in musical expression. Particular colors were treated as subordinate to diverse intensities of color. A new notational system for performance on the Sarabet was patented by the inventor (see Fig. 5B).

Many color-projection instruments appeared shortly after 1920 – the year generally considered to mark the birth of kinetic art. For example, in 1920 the English painter Adrian Klein designed a color projector for stage lighting. His instrument, which demonstrated a color theory involving logarithmic division of the visible spectrum, was operated from a two-octave keyboard (Fig. 6, overleaf). Leonard Taylor, another English experimenter, built a device whereby twelve colored lights were activated from a thirteen-note keyboard. Although no relay switches were used, various "organ stops" controlled individual colors which could then be diluted with a variable-intensity daylight lamp (the thirteenth note). Similar color experiments were carried out between 1920 and 1925 by Achille Ricciardo who built a colored- light instrument for the *Teatro del Colore* in Rome, and Richard Lovstrom who during the same period in the United States patented an apparatus to perform color-music. The Czech artist Zdenek Pasanek worked with a color-keyboard as did Alexander Laszlo, who introduced his device (called a *Sonchromatoscope* – Fig. 7 overleaf) in 1925 at the Music-Art Festival at Kiel. Laszlo's book, **Die Farblichtmusik**, was published the same year. His preludes for piano and colored light employed a special system of notation.

From 1920 to 1925, Ludwig Hirschfeld-Mack studied at the *Weimar Bauhaus*. During the summer of 1922 he and others were rehearsing one of the shadow plays which were often presented at the Bauhaus. When one of the acetylene bulbs they were using needed replacement, Hirschfeld-Mack accidentally discovered that shadows on a transparent paper screen were doubled. By using acetylene bulbs of different color, "cold" and "warm" shadows appeared simultaneously. The principle was refined in subsequent years by using a type

of color-organ. This device enabled Hirschfeld-Mack to present reflected-light compositions with his own music. The lighting technique was introduced to the public in 1923 at a film matinee at the Berlin Volksbühne and later in Vienna with Fernand Léger's experimental films. After 1960, Hirschfeld-Mack lived in Australia where he continued his activities, dispensing with the keyboard of his apparatus.

WILFRED'S *CLAVILUX*

Most famous of the experimental color-instruments was the *Clavilux*, developed in 1922 by Thomas Wilfred at a cost of over $16,000. Wilfred completely rejected theories which presumed correspondence between light and sound. Light alone was the principal feature of a new art-form which he named "Lumia." It is true that Van Deering Perrine, the noted American painter and friend of Isadora Duncan, had experimented with various color-instruments around 1912 — and he may have been the first to reject the direct allusion to music — but Wilfred was able to develop the full implications of pure light manipulation. He considered the term "color-music" a metaphor; yet his art resembled music by including factors of time and rhythm in live performance.

Wilfred first used light in a purely abstract manner, but later decided form and movement were essential. These he achieved via filters which permitted the projection of moving geometrical shapes onto a screen. Vasily Kandinsky's theory that geometrical patterns supplement non-objective use of color possibly influenced Wilfred's work.

The *Clavilux* was introduced to the public on 10 January 1922 in New York although the first of several instruments had been partially completed in 1919. This was after more than a decade of experimentation. Wilfred's main instrument, employing six projectors, was controlled from a "keyboard" consisting of banks of sliders (Fig. 8A, facing page). An elaborate arrangement of prisms could be inclined or twisted in any plane in front of each light source. Color intensity was varied by six separate rheostats which the performer operated delicately with his fingers. Selection of geometric patterns was effected via an ingenious system of counterbalanced disks. Wilfred's shifting light

Fig. 6 (above): The 2-octave controller of Adrian Klein's color projector for stage lighting (1920). This instrument demonstrated Klein's color theories in which the visible spectrum was logarithmically divided.

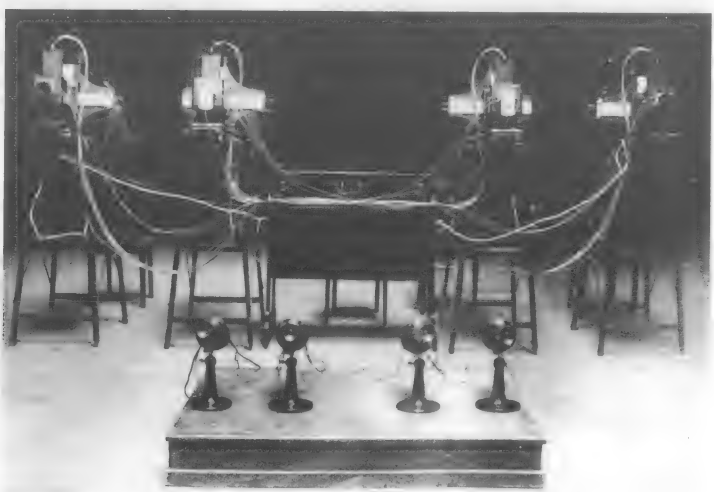


Fig. 7 (right): Alexander Laszlo's **Sonchromatoscope** was introduced at the 1925 Music-Art Festival at Kiel. Laszlo published a series of preludes for piano and colored light which employed his own system of notation.

performances have been compared by many to the beautiful display of the Aurora Borealis (see Fig. 8B, below right).

During the years 1924 and 1925, Wilfred gave an extensive recital tour throughout the United States, Canada and Europe. The late Percival Price once told the author about a *Clavilux* recital (5 January 1925) he attended in Toronto. "Before the concert there seemed to be an attitude of snobbery toward the new art, but after Wilfred began to perform everyone was spellbound." Nearly all of the published reviews substantiate this conclusion, and the critics' difficulty in finding the right words to describe the effect of the performance is evident. Deems Taylor, for example, wrote:

> The fact that Thomas Wilfred's *Clavilux* is commonly known as the color-organ is not the only reason why a music reviewer should have attended his recital last night in Aeolian Hall. For this new color-art might very aptly be called music for the eye . . . it is color and light and form and motion, but it is not painting, nor sculpture, nor pantomime. It is difficult to convey in words. Describing the Clavilux to one who has not seen it is like describing an orange to an Esquimo.

Fig. 8a (above): Thomas Wilfred at the console of his **Clavilux** (1922). Moving geometrical shapes were projected onto a screen as the performer controlled the color intensity of various light sources. An elaborate arrangement of prisms could be twisted or inclined in any plane.

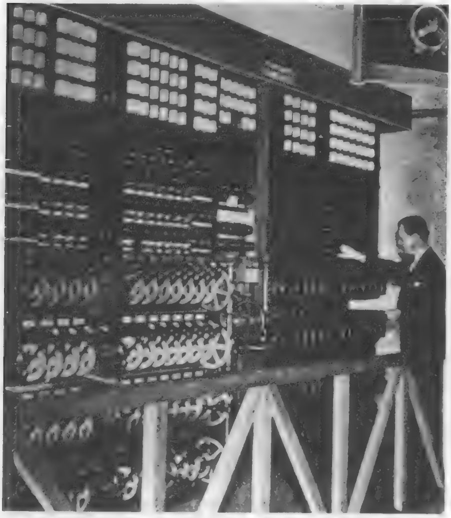
Fig. 8b (below): Wilfred preparing one of his "Lumia" compositions for the world tour of 1924-1925. Critics compared his performances of kinetic light to the magnificent display of the Aurora Borealis.

Wilfred notated his compositions, and they were given opus numbers like musical works. The most enthusiasm seems to have been generated by **A Fairy Tale of the Orient** (op. 30). A writer for the **Louisville Times** (20 November 1924) described the work as "an Arabian night of color, gorgeous, raging, rioting color yet not rioting either . . . . Jewels were poured out of invisible cornucopias; lances of light darted across the screen to penetrate shields of scarlet or green or purple." Another reviewer described Wilfred's work in the **Manchester Guardian** (18 May 1925) as like a dream of "some unearthly aquarium where strange creatures float and writhe, and where a vegetation of supernatural loveliness grows visibly before the spectator." From the reports, it seems that Wilfred's art probably surpassed the dramatic effects produced by today's Laser performances — especially since his audiences had never witnessed anything like it before. Although most of Wilfred's recitals were presented in complete silence, there were also collaborative performances where music was interpreted in colored light. One such rendition of Rimsky-Korsakov's **Scheherazade** was presented in 1926 with the Philadelphia Orchestra directed by Leopold Stokowski.

CONCLUSION

In the decades following Wilfred's introduction of the *Clavilux*, many artists experimented with the technique of interpreting music in colored light. George Hall, for example, built a device in the 1930s which he called the *Musichrome*. It was equipped with eight keys to control two sets of four colors each. In a brochure about his instrument, Hall indicated no set rules to follow when interpreting musical compositions. "The accompanist must follow his own color reactions to the music played. Generally speaking, heavy, loud, thunderous

Fig. 9: Frederick Bentham adjusting the **Light Console** before a performance at the Strand Electric Demonstration Theatre in London (1937). He presented many concerts with orchestral recordings and improvised lighting.



music calls for the use of red, although there are times when an intense blue is desirable."

Frederick Bentham gave performances on a *Light Console* at the Strand Electric Demonstration Theatre in London shortly before the Second World War (Fig. 9). At his concerts, he accompanied phonograph recordings of many works including **Pictures at an Exhibition**, **The Firebird**, and **Prometheus**. Describing a presentation of Scriabin's color-symphony on 31 March 1937, Bentham wrote:

> The first snag was that I could not feel in accord with the music (I wonder what my present day impression would be) and the second was the difficulty of looking at the score at the same time as keeping my eyes glued to the stage. A colour organist who does not do the latter is equivalent to the musician who plays without listening to himself . . . . After some rehearsal the ordered sequence of colour changes was extracted but . . . in the end I took the colours as an organist might take a simple theme for improvisation and let myself go to the music.

Extensive technical innovation after World War II made possible the permanent installation of a large number of "color-organs" in theaters and galleries all over the world. These instruments were operated either by live performance or they have been programmed to present light sculptures. One such work, Wilfred's **Lumia Suite** (opus 158), was displayed during the late-1960s in the New York Museum of Modern Art. For two decades (and until recently), the engineer and lighting designer Christian Sidenius gave performances of colored light with music at his private installation in Sandy Hook, Connecticut. His elaborate equipment included stereopticon color-projectors, and he called his concerts, "Lumia, the Theatre of Light" in honor of Wilfred's original Lumia Theatre of New York. And today, similar multi-media experimentation is evident. For example, Jan Gjessing and his artistic collaborators in Norway have presented many concerts with their stereoscopic projectors. Gjessing works with what he has termed "sound-to-light liquid cells" which modulate visual patterns in real-time.

Within the past fifteen years the decreasing cost of technology has fired a revival of interest in the practical development of instruments to perform color-music. One result has been that today's consumers of both art and of entertainment events have come to expect that their aesthetic experiences will be generated by mixed-media – often including colored light and sound. Annual summer concerts of sound with lighting are presented in Paris; and in the Soviet Union, a large organization under the direction of Bulat Galeev has constructed color-instruments which have been used to present huge outdoor spectacles of sound and light attended by thousands. In the United States and Europe, many color-music concerts of more modest attendance have been presented by various groups. And audiences in our multi-media age have responded enthusiastically to this veritable explosion of activity. Enterprises such as Laser Images Incorporated, for example, have toured colleges with portable color instruments for live performances. In addition to selections in rock style, music by Corelli, Strauss, Holst, and Copland has been included in the repertoire accompanied by colored light. The Laser Arts Society holds monthly meetings in California to discuss creative applications of Lasers for kinetic sculpture. Nor have commercial applications of color-music been neglected. For the recent holiday season, Macys provided its "gift to New York City – a one-of-a-kind outdoor extravaganza with lasers, lights and holiday music to delight one and all." Shoppers could purchase an inexpensive "color-organ" inside the store (the well-known devices are attached to a home stereo and different audio frequencies trigger various colored lights), then they could step outside to witness the display of lasers with music. Their show was indeed impressive. Huge colored-laser patterns moving in time to music were projected onto the side of their tall building which occupies an entire city block.

Although experimenters during the past two centuries could hardly have anticipated today's widespread use of laser light in combination with electronic computers, these marvelous inventions are in some ways refinements of earlier technological proposals for a viable color-music instrument. Every generation, it seems, must re-discover and re-define the art of color-music for itself. And rarely does there appear to be awareness that previous activity has occurred. The current catalog of one major video company, for example, informs its clients that with their product, "a new art form was born. Blending color, music and movement, this new medium is a marriage of sight and sound."

A version of these articles was originally published in **Leonardo** vol. 21, no. 4, pp. 397-406 (1988).

Fuller referencing and footnoting appears in the 1988 **Leonardo** version of the articles. **Leonardo** is available from 2030 Addison St., Suite 400, Berkeley CA 94704.

Ken Peacock teaches at New York University, where he directs the Computer Music Technology program. He believes that even in our own century, there's a bright future for innovative color organs.

RECORDINGS

Reviews by Mike Hovanscek

Beginning with this set of reviews, Mike Hovanscek of Pointless Music *will be reporting on independently-produced recordings for* **Experimental Musical Instruments**. *If you have releases involving experimental and home-made instruments, please send copies to to Mike Hovanscek, 1228 Fairview Drive, Kent, OH 44240 USA.*

Earlier recordings reviews appearing in EMI have been rather dry ("designed to be informative rather than critical" is the phrase we have used). We will stick with the informational function, but Mike's reviews will show a little more leeway for opinion, critical thought, subjective observation.

HITTING BIRTH: **HITS OF BIRTH**

On cassette, from P.O. Box 4112, Pdx. OR 97208

This band creates music that extends beyond the focus of typical EMI interests, with its punk origins and its "can we play at your club if we promise not to break anything?" sensibilities. But, then again, "typical" is a word that will never be used to describe Hitting Birth as they layer electric shopping carts, tapes, "things we blow through" and the like over heavy percussion and punk inspired vocal rants.

Their sound is like a cross between the Butthole Surfers and a dozen sound effects records being played simultaneously. Rather than focusing on any particular sound source, the members of Hitting Birth prefer to use a constantly shifting pool of sounds many of which are swept up into the rhythmic framework of each piece. One piece even wanders into rap music, successfully abandoning all of the clichés of that format while exploring many of its rhythmic and sound manipulating possibilities.

Hitting Birth may not be utilizing the most advanced experiments in sound but they manage to create an impressive wall of sound with some pretty minimal sources. Check this band out if you are interested in harsh, chaotic, clever sound manipulations within a heavy, rock-based rhythmic framework.

FRANCISCO LÓPEZ: **EL MUNDO AZUL DE LOS PICNOGONIDOS** and **SAMPLE 2**

On cassette, from Toracic tapes – Miguel A. Ruiz, Villamanin, 5-28011, Madrid, Spain / Nihilistic Rec., Esdoornlaan 6A, 1521 EA W'veer, Netherlands.

These tapes are examples of two lines of work that Francisco López is currently developing. *El Mundo Azul de los Picnogonidos* represents his work with environmental music utilizing the sea as his sound source.

As an extension of *El Mundo* Francisco is working on a live show which will involve the manipulation of samples derived from recordings of city soundscapes performed over video works.

Sample 2, in contrast to the long, static pieces in *El Mundo*, is a series of numbingly short (averaging around 40 seconds), upbeat pieces using a variety of sampled sources.

SUSAN RAWCLIFFE AND ALEX CLINE: **PERSONAL ETHNIC**

On cassette, from PO Box 7283, Glendale, CA 91205

Susan Rawcliffe is an extremely talented wind instrument designer who plays a wonderful variety of ceramic flutes, ocarinas and whistles, many of which have unusual shapes and tone qualities extending the instruments well beyond their pre-Columbian roots. (For more on Susan's instruments see EMI Vol. I #6.)

Alex Cline is a perfect collaborator for Susan as he plays an odd assortment of rattles, pods, howlers, wind-wands, singing bowls, bodhrans, and thumb pianos.

The music that results from this collaboration is a mature, complex combination of sounds which is at once new and ancient as Susan's unique ceramic instruments produce a variety of warbles and microtonal beats over pieces that would otherwise sound like aboriginal musics.

Susan Rawcliffe and Alex Cline are superb musicians who successfully explore the wide range of sounds and relationships between sounds that lie within their instruments.

SARAH HOPKINS AND ALAN LAMB: **SKY SONG**

On CD and cassette, from GPO Box 4168, Darwin 0801, Australia

Sarah's use of "Whirlies" (flexible tubes that produce pitches from the overtone series when they are whirled around) has been examined in the pages of EMI in the past. *Sky Song* is a fascinating development of Sarah's music as she teams up with Alan Lamb to further explore the potential of overtones and harmonics in music.

Sarah's background in classical and contemporary cello performance, in addition to her use of whirlies, handbells, and voice, are a perfect complement to Alan's "wire music". Attaching specially developed piezo-electronic transducers to abandoned telegraph wires, Alan is able to record the complex sounds that are produced by the effects on these wires by sun, wind, birds, and insects. The gentle and complex harmonic sounds produced by Alan's wire music are a haunting wash of tones that flow around the brighter melodies of Sarah's cello.

The ethereal, droning pieces in *Sky Song*, which are reminiscent of Tibetan invocations in their effective use of shifting harmonics, develop at a measured pace without ever sounding self-indulgent or blandly new age. This is no easy feat considering the long list of competent musicians who have faltered at the same challenge.

I don't know how Hopkins and Lamb ever found each other but I hope they continue to work together. Their mutual exploration of complex overtones and harmonics are some of the most interesting I have heard in some time.

THOMAS BLOCH: **CHRIST HALL: Homage a Marc Chagall**

On CD or cassette from GMI, 2505 Logan Dr., Loveland, CO 80538

Thomas Bloch composed *Christ Hall* for the Glass Music Ensemble, made up of leading members of Glass Music International (the organization for players of glass instruments) who gathered at Sarrebourg, France for the fourth International Glass Music Festival in April, 1990. This recording, directed by India Dennis, is an important addition to the

collection of works for glass instruments. It is fortunate that such a substantial undertaking was captured on CD, making it more likely to win the attention of the members of the music press who feel that they are too important to review cassette-only releases. The attention these people can channel into *Christ Hall* has the potential to generate more interest in glass music than it has received at any time in the past.

The Glass Music Ensemble employs several interesting instruments in this performance, including glass armonicas (tuned sets of glass bowls revolving on a horizontal axle, played by the friction of moist fingers), seraphim (tuned sets of musical glasses, normally played by the circular movement of a moistened finger around the rim), and verillon (traditionally also a set of glasses, but in this case a set of tuned glass tubes created and played by ensemble member Sascha Reckert). Soprano voice, synthesizer, and the early 20th century electronic instrument *Ondes Martenot* bring additional timbres to the work.

Impressionistic elements appearing in *Christ Hall* bring the large swells of tones produced by the friction instruments to the forefront as they waft around the soprano voice throughout most of the composition. At other times, glass instruments are struck to produce bell-like tones.

Despite all the merits of this work, there are a couple of flaws that slightly mar its otherwise successful sound. One is the use of the synthesizer in the ensemble. When musicians explore the potential sounds within an instrument it seems counter-productive to bring in synthesizer accompaniment, because listeners tend to attribute most if not all of the unusual sounds to the synthesizer. Had this ensemble relied on wind instruments (including, perhaps, glass flutes) or bowed strings (which produce tones that are similar in many ways to glass friction instruments but would also produce an interesting contrast) the listener would not be as likely to discount the contribution of the glass instruments.

The second flaw in *Christ Hall* is its development. The piece actually develops rather nicely for the first third of the composition, after which it begins to basically re-state the initial movements for the remainder of the piece. Had Thomas Bloch developed the composition further the result might have been more effective and somewhat more engaging for the listener.

Although these considerations detract a bit from the result, they do not stop this recording from being a very substantial and exciting document of the use of glass instruments and the work of Glass Music International.

NOTICES

Ventriloquism Cassette Magazine seeks your most adventurous home recordings for its first issue. Submit on cassette, along with any information & visuals you'd like to share, and an address where you can be reached. Send all, or write with questions, to: Ventriloquism, 564 Waller St., San Francisco, CA 94117.

MUSIC BY HARRY PARTCH: CRI has released 2 CDs: **The Bewitched** and a collection entitled **The Music of Harry Partch**; as well as a video cassette of the 1972 documentary, **The Dreamer That Remains**. CRI is also carrying Partch's book, **Genesis of a Music**, and Thomas McGeary's 2 Partch books, **Bitter Music** and **The Music of Harry Partch: A Descriptive Catalog**. CRI 73 Spring St., Room 506, New York NY 10012.

Now available: Xenharmonikon Nos. 7-13, cassette by experimental Indonesian composer I Wayan Sudra. Soon to be published: John Chalmers' **Divisions of the Tetrachord**. Write for complete catalogs. Frog Peak Music and American Gamelan Institute, Box A-36, Hanover, NH 03755.

Life is hard for the insomnious dyslexic agnostic: He lies awake at night, wondering if there is a dog.

MUSIC FROM BOB GRAWI'S GRAVIKORD – the electric double harp based on the African kora (EMI 2/88); Cassettes: "Making Waves" (solo), "Rising Tide" (ensemble with flute, bassoon and percussion) $11; "Rising Tide" CD, $17, includes shipping. For information or orders write: White Bear Enterprises, PO Box 106, Florida, NY 10921.

QUARTZ CRYSTAL "SINGING" BOWLS", frosted and clear in 12 sizes, in all musical notes available – magical – powerful healing tools for meditation and stress elimination, balancing energies, etc. Also available: handheld square drums, hoop and dance drums as well as water and ceramic kettle drums, various types of RAINSTICKS, melodious chimes, bells, cymbales. Largest distributor, lowest prices. The CRYSTAL STORE 1-800-833-2328.

Experimental Sound Studio is a non-profit organization for the production and promotion of innovative sonic arts. ESS has studio facilities and several other programs for members. New from ESS: **Sounds From Chicago**, a curated series of 23 half-hour radio programs featuring audio art, poetry, improvisational music, world music, performance art and more. Heard on several radio stations, and available free to broadcasters. ESS, 5150 N Paulina, Chicago, IL 60640 (312) 784-0449.

JUST INTONATION CALCULATOR by Robert Rich and Carter Scholz. A composer's tool for just intonation. Internal sound for tuning reference; microtonal ear training; shows modulations; reduces fractions; converts between ratios, cents, and Yamaha tuning units; MIDI tuning dumps for many brands of synthesizers. Requires Macintosh with Hypercard -- only $10.00. Soundscape Productions, Box 8891, Stanford, CA 94309.

EMI BACK ISSUES: Back issues of **Experimental Musical Instruments** numbered Volume VI #1 and later are individually available for $3.50 apiece. Earlier issues are available in volume sets of 6 issues each, photocopied and spiral bound: Volumes I through V, $14 per volume. Order from EMI, PO Box 784, Nicasio, CA 94946, or write for complete listing. Corresponding cassette tapes also available for each volume; see information below.

CASSETTE TAPES FROM EMI: **From the Pages of Experimental Musical Instruments**, Volumes I through VI are available at $6 per volume for subscribers; $8.50 for non-subscribers (each volume is one cassette). Each tape contains music of instruments that appeared in the newsletter during the corresponding volume year, comprising a full measure of odd, provocative, funny and beautiful music. Order from EMI, Box 784, Nicasio, CA 94946.

MICROTONAL MIDI TERMINAL (vers. 1.2) by Denny Genovese lets you play nearly any MIDI synthesizer in Just Intonation! A veritable "tuning processor" as well, it has many features for constructing, editing, transposing, analyzing and printing Just Scales. Tuning data is shown in Ratios, Cents, Frequencies and Yamaha TU's. Those without a MIDI instrument can hear the Just scales on the computer's built in speaker. Holds 16 scales in memory, which are selected by single keystrokes. Tunings may be transposed into any key with another quick stroke. Requires IBM XT/AT or compatible and, for performance, an MPU-401 or compatible MIDI interface. $60 from DENNYS SOUND & LIGHT PO Box 12231 Sarasota, FL 34278.

Doug Hollis, Ward Hartenstein, Reinhold Pieper, and anonymous Vietnamese builders of the water-driven bamboo sound structures called *Tang Koa*.

Musicworks 50, Summer 1991 (1087 Queen St. West, Toronto, Ontario, Canada M6J 1H3) contains several articles relating to unusual musical sound sources:

"Harbour Sounds Ashore", by Michael Burtch, describes how the author, with the aid of a team of engineers and workers, created a sound sculpture on a boardwalk at Sault Ste Marie using the huge boat horns and other materials from the ship Chief Wawatam. The big horns rise from the boardwalk. Suspended in a chamber beneath are steel bars and a motor-driven striker. The article focuses on contemporary social and land-use aspects of the sculpture, as well as maritime-historical aspects, as much as the mechanics of the sculpture itself. Appended to the article is a listing of sound sculpture articles that have appeared in **Musicworks** over the years.

"The Trick is in the Imagining" is an interview with members of the Robert Minden Ensemble, which performs with flower pot chimes, waterphones, shell trumpets, hummers, and a variety of other unconventionals along with trumpet, flute and French horn.

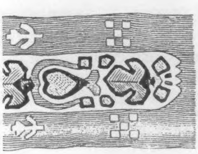
"Review Feature: Het Apollohuis" is a collection of reports on performances and publications from Het Apollohuis, a Dutch arts center which has consistently supported work with new and unusual sound sources. Most prominent is a review of Akio Suzuki's new book and CD, *Soundsphere*.

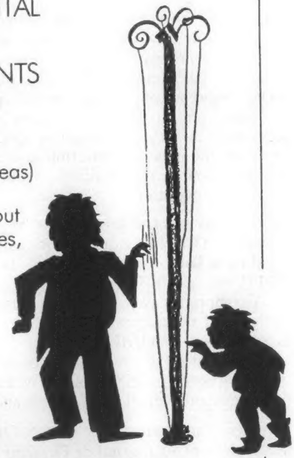
Articles to note in **American Lutherie** #26, Summer 1991 (8222 South Park Ave, Tacoma, WA 98408):

"Todd Brotherton Interviews Wood Merchant Myles Gilmer" contains discussions of tropical tonewoods, the politics of continuing to harvest them, and musically valuable temperate zone woods.

In "Star of David: Dan Erlewine Interviews his Early Mentor Herb David", Herb David describes some unique harp-zither-lyre designs.

"Giveaway Dulcimers" presents an idea for making quickie dulcimers, simple but playable, for giveaways. It's presented as a promotion and tax-mitigation trick, but you don't have to be an accountant to see that it's a nice idea.





The following list contains selected articles relating to unusual musical instruments which have appeared recently in other publications.

"Music from the lyre recreates the sounds of Ancient Greece" by Sylvie Overnoy, in **The Manchester Guardian Weekly** (Manchester, England), July 13, 1991.

A report on a recent concert at the Metz Museum, in which archaeologist and musician Annie Bélis presented a limewood and oxhide replica of the Greek lyre of 2000 years ago, playing music from extant papyrus manuscripts. Both the instrument copy and the musical transcription were based as much as possible upon the best available – but still quite sketchy – surviving information.

"Technology and Culture Change: The Development of the *Berimbau* in Colonial Brazil" by Richard Graham, in **Revista de Musica Latino Americana** Vol. 12 #1, Spring/Summer 1991 (University of Texas at Austin).

A comprehensive, carefully documented account of the history and development of the Afro-Brazilian resonated musical bow. Underlying this article and other work by Richard Graham is a movement toward replacement of the static concept of traditional culture with a more dynamic sense of cultural and technological growth and change.

"Synthèse Photosonique" by Jacques Dudon & Daniel Arfib, in **Supplement au Journal de Physique** Vol. II, C2, Tome 51 (Les Editions de Physique, Ave. du Hoggar 2.1 de Courtaboeuf, B.P. 112, 91.944 Les Ulis cedex, France). Written in French.

The authors describe the workings of their Photosonic Synthesizer, an instrument which uses light shining through a rotating acetate disk and onto a photoelectric cell, to generate a current that can be sent to an amplifier and speakers. The disk itself is transparent, but marked in opaque ink in concentric patterns which periodically interrupt passage of the light as the disk rotates. This causes controllable alternation in the resulting current, thus creating the patterns of vibration in the ensuing amplified sound.

"Frontiers in Music and Healing: An Interview with Jonathan Glasier and Linnea Reid" by Michael Riversong, in **The Journal of Borderland Research, Vol. XLVII #5, Sept/Oct 1991 (PO Box 429, Garberville, CA 95440-0429).**

Jonathan Glasier talks about recent work with his Interval Foundation. The foundation's journal, **Interval Magazine**, published during the late 70s and early 80s, was in its time the only forum with a major focus on new instruments, and an important inspiration for EMI. Interval Foundation now runs the Sonic Arts Gallery in San Diego, a display space for experiments in light and sound; it is also involved in public education work and the creation of public sound sculptures, and has recently put out a sampler tape of music outside of twelve-tone equal temperament.

"Hydrodaktulopsychicharmonica" in **Logosblad** Vol. 13 #8, 1991 (Kongostraat 35, 9000 Gent, Belgium). Written in Dutch.

A 3-page report on glass musical instruments, from tapped musical glasses appearing in a 15th century manuscript, through 19th century glass harmonicas, to the 20th century's Glass Orchestra.

"Acoustics of the Glass Harmonica" by Thomas D. Rossing, in **Glass Music World** July 1991 (2503 Logan Drive, Loveland, CO 80538).

A 1-page discussion of the musically useful modes of vibration for wine glasses. Included are reproductions of holographic interferograms, graphically showing two of the modes quite clearly in action.

"The Mbira: Gourd Amplification" by Richard Selman, in **The Gourd** Volume 21 #3, Summer 1991 (PO Box 274, Mt. Gilead, OH 43338).

Instructions and additional background information on how to create large gourd resonators for mbiras, including notes on attaching rattles to the resonator.

"Blue Man Group: Tubes" by Lynn Swanson, in **High Performance** #54, Summer 1991 (1641 18th St., Santa Monica, CA 90404).

Review of a performance piece presented by the Blue Man Group at La Mama in New York City earlier this year. A number of sound sources figured into the act, including, prominently, a big end-struck PVC percussion aerophone for several players.

"Undercutting Tone Holes on Bass Clarinets" by Pat Hiatt, in **TechniCom** Vol. 15 # 1 & 2, and "Sealing Clarinet Pad Seats (no author credited) in **TechniCom** Vol. 15 #4 (National Association of Professional Band Instrument Repair Technicians, PO Box 51, Normal, IL 61761).

Two highly practical articles on the fine art of wind instrument tone hole design, with an emphasis on tone hole bore and rim shape.

"If Intervals be the Food of Love, Play On" by Thomas Arne, in the **San Diego Reader**, August 22, 1991.

A 1-page introduction to the idea of non-standard tunings, serving to publicize a talk and demonstration that was later given by instrument maker and theorist Ivor Darreg at a bookshop/gallery in San Diego.

Articles on pan have turned up in three diverse sources recently:

"Steel Drums" by Knolly Moses, in **Emerge** Vol. 2 #10 (599 Broadway, New York, NY 10012) is an overview of pan culture, with bows to the instrument's history, development and dissemination, its significant social roles, and prominent makers, tuners and performers.

"A Conversation with Andy Narell" by Susan Jette in **Percussive Notes** Volume 29 #6, August 1991 (PO Box 25, Lawton, OK 73502), is an interview with the jazz pan player, with an emphasis on Narell's work as it relates to current developments in the native land of the steel drum, Trinidad.

"Le Steelband: Bref Aperçu Historique" by William Taniféani, in **Percussions** No 14, August 1991 (18 rue Théodore-Rousseau, F-77960 Chailly-en-Bière, France) is a concise history (in French) of steel band.

Exploratorium Quarterly Vol. 15 #2, Summer 1991 (3601 Lyon Street, San Francisco, CA 94123) has a special focus on rhythm, as it manifests itself in nature and culture, both spatially and temporally. One of the articles is "Landscape in 7/8", by Nicholas Sammond, "a look at some artists who work in the blurry border region where the rhythms of visual art and music meet." Among the artists whose work is discussed are

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